



1971 OPERATING
SUMMARY

MARKHAM

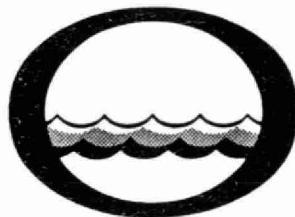
WATER POLLUTION CONTROL PLANT

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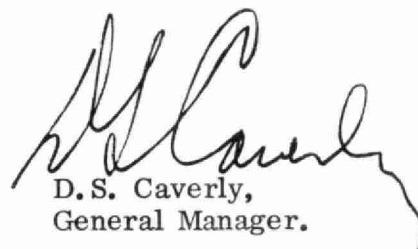


Water management in Ontario

Ontario
Water Resources
Commission

We are pleased to submit for your consideration a summary of operation during 1971 of the water pollution control plant serving your community.

This operating summary contains parameters normally used to measure plant performance and loading, as well as relevant cost data. Because of the concern over eutrophication of our lakes and of the requirement, in many parts of Ontario, to remove the major contributing factor, results of analysis for phosphorus appear in this summary.

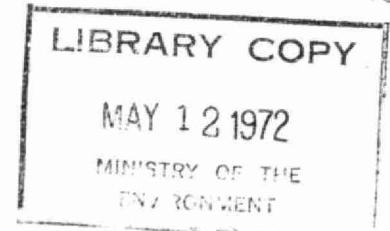


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General Manager.



D. A. McTavish

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MARKHAM

WATER POLLUTION CONTROL PLANT

operated for

THE TOWN OF MARKHAM

by the

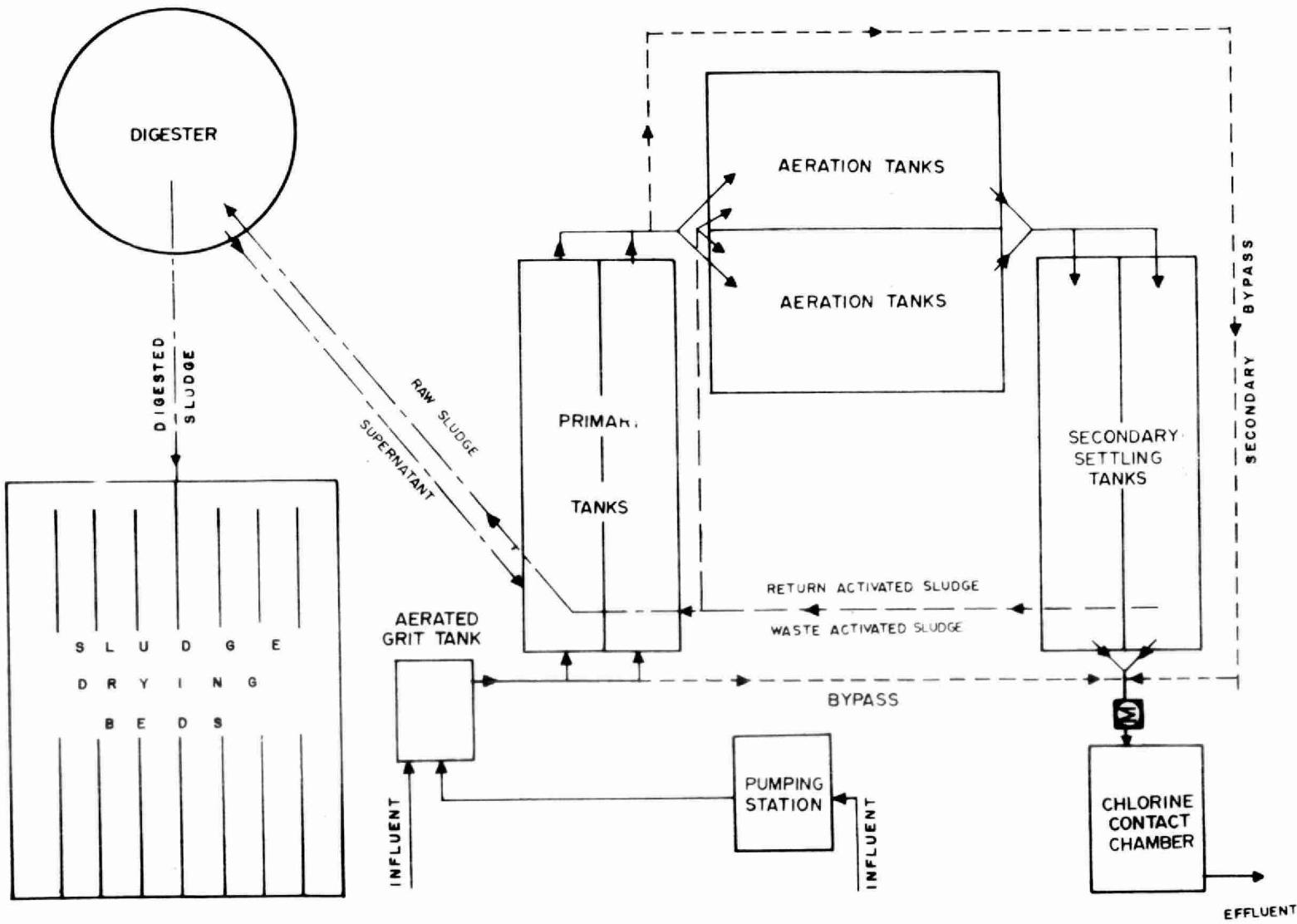
ONTARIO WATER RESOURCES COMMISSION

1971 ANNUAL OPERATING SUMMARY

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TOWN OF MARKHAM
WATER POLLUTION CONTROL PLANT



DESIGN DATA

PROJECT NO.	2-0040-59
TREATMENT	Activated Sludge
DESIGN FLOW	0.67 mgd
DESIGN POPULATION	8,000
BOD - Raw Sewage	215 mg/l
- Removal	95%
SS - Raw Sewage	220 mg/l
- Removal	95%

PUMPING STATION

Type: Fairbanks-Morse
 Size: Two 350 gpm @ 40' tdh

PRIMARY TREATMENT

Comminution

Type: C.P. Barminutor
 Size: One 18"

Grit Removal

Type: Aerated
 Size: One 13' x 6' x 8.1' swd
 (4,240 gal)
 Retention: 9.2 min

Primary Sedimentation

Type: Jeffrey
 Size: Two 42' x 12' x 7' 9" (avg)
 (48,800 gal)
 Retention: 1.76 hours
 Loading: Surface, 660 gal/ft²/day
 Weir, 27,800 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air, single pass
 Size: One 51' x 22' x 15' (33,600 cu ft
 or 210,000 gal)
 One 51' x 28' x 15' (39,230 cu ft
 or 245,000 gal)

Air Supply

Type: Sutorbilt and Aerzen
 Size: One 700 scfm @ 5 psi (standby)
 One 1075 scfm

Diffusers

- 72 spargers (17" centre)

Secondary Sedimentation

Type: Jeffrey
 Size: Two 42' x 12' x 10.5' (avg)
 (66,000 gal)
 Retention: 2.38 hours
 Loading: Surface, 660 gal/ft²/day
 Weir, 4,750 gal/ft/day

CHLORINATION

Type: W & T
 Size: One 70 lb/day

Chlorine Contact Chamber

Size: 20' x 11.38' x 8.5' swd (12,080 gal)
 Retention: 26 min

OUTFALL

- to Exhibition Creek
 (tributary of Rouge River)

SLUDGE HANDLING

Digestion System - Single-stage

Type: Mixed by recirculation
 Size: One 45' dia x 20' swd (34,240 cu ft
 or 220,000 gal)
 Loading: 0.67 lb/cu ft/ mo

Sludge Drying Beds

Size: Four 90' x 20' (7,200 sq ft)

'71 Review

GENERAL

Flows to the plant have increased steadily since 1968. During 1971, the average daily flow to the plant equalled or exceeded the plant's capacity 80 percent of the time.

Throughout the year the plant process experienced problems with industrial wastes. This is indicated by the increase in BOD accompanied by a decrease in suspended solids. The Division of Industrial Wastes contacted the municipality and instructed the by-law enforcer to keep industrial waste dumping in check.

During the year, tube settlers were installed in one of the final clarifiers. The tube settlers were to increase the hydraulic capacity of the clarifier. After an intensive investigation by our Division of Research, it was concluded that the tube settlers can increase the hydraulic capacity of the final clarifier by 50 percent. However, the tubes are subject to plugging and a purging device will be installed in 1972.

Late in the year, final plans and specifications were drawn up for the construction of chemical precipitation facilities for the plant. Construction of the above is expected to begin early in 1972.

PLANT FLOWS and CHLORINATION

The average daily flow to the plant was 0.77 million gallons. The maximum daily flow was 1.27 million gallons, however the maximum rate at which the plant received raw sewage was 2.00 million gallons per day and was recorded on five of the 12 months in 1971. The total flow to the plant during the year was 280 million gallons.

Flows greater than the design capacity of 0.67 mgd received primary treatment and chlorination. The final effluent was chlorinated throughout the year. A total of 13,010 pounds of chlorine was used to maintain a residual in the effluent of 0.5 mg/l with an average dosage of 4.6 mg/l.

PLANT EFFICIENCY

The average influent BOD and suspended solids were 174 mg/l and 211 mg/l respectively. The effluent BOD and suspended solids averaged 33 mg/l and 28 mg/l respectively. These figures represent a reduction of 81 percent BOD and 87 percent suspended solids.

The average reduction in total phosphorus was 37 percent. Such a reduction is normal for a secondary treatment plant.

SLUDGE DIGESTION and DISPOSAL

A total of 2.44 million gallons of raw sludge was pumped to the digester. This sludge contained an average of 3.6 percent total solids of which 63 percent were volatile solids.

The digester produced 1.27 million gallons of digested sludge containing 2.9 percent total solids of which 56 percent were volatile solids. Under a sludge disposal contract, 6,924 cubic yards of digested sludge were removed from the digester for disposal.

CONCLUSIONS and RECOMMENDATIONS

To ensure the best operation of the plant process, industrial wastes accepted at the plant must be limited to the amounts specified in the municipality's sewer use by-law.

Although the installation of tube settlers will increase the hydraulic capacity of the secondary clarifiers, the increase in hydraulic capacity will handle present peak loadings only and therefore there is no allowance for additional flow to the plant. Also there is no allowance for additional organic loading. With the steady increase in both hydraulic and organic loading to the plant, expansion of the plant should be considered before restrictions are placed on municipal development.

PROJECT COSTS

NET CAPITAL COST (Final)	\$608,711.07
DEDUCT - Portion financed by CMHC/MDLB (Final)	<u>-</u>
Long Term Debt to OWRC	<u>\$608,711.07</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1971	<u>\$181,308.64</u>
Net Operating	\$ 43,581.22
Debt Retirement	5,205.00
Reserve	2,220.41
Interest Charged	<u>34,143.11</u>
TOTAL	<u>\$ 85,149.74</u>

RESERVE ACCOUNT

Balance @ January 1, 1971	\$ 33,556.23
Deposited by Municipality	2,220.41
Interest Earned	<u>2,213.04</u>
	\$ 37,989.68
Less Expenditures	<u>511.97</u>
Balance @ December 31, 1971	<u>\$ 37,477.71</u>

OPERATING COSTS

PAYROLL	4 6 %
FUEL	2 %
POWER	1 3 %
CHEMICALS	6 %
GENERAL SUPPLIES	2 %
EQUIPMENT	< 1 %
REPAIRS & MAINTENANCE	3 %
SUNDRY	26 %
WATER	< 1 %
TRAVEL	1 %

1971 COSTS

TOTAL ANNUAL COST

NET OPERATING	% 51
DEBT RETIREMENT	% 6
RESERVE	% 3
INTEREST	% 40

YEARLY OPERATING COSTS

YEAR	SEWAGE TREATED in million gallons	TOTAL OPERATING COSTS	TREATMENT COSTS	
			\$ per million gal	¢ per lb BOD
1967	224.613	\$20,300.68	\$ 90.38	9.3 cents
1968	204.18	21,533.20	105.46	11.5 cents
1969	216.9	29,098.52	134.16	9 cents
1970	249.0	36,428.20	146.29	9 cents
1971	280.0	43,581.22	156.00	4 cents

MONTHLY OPERATING COSTS

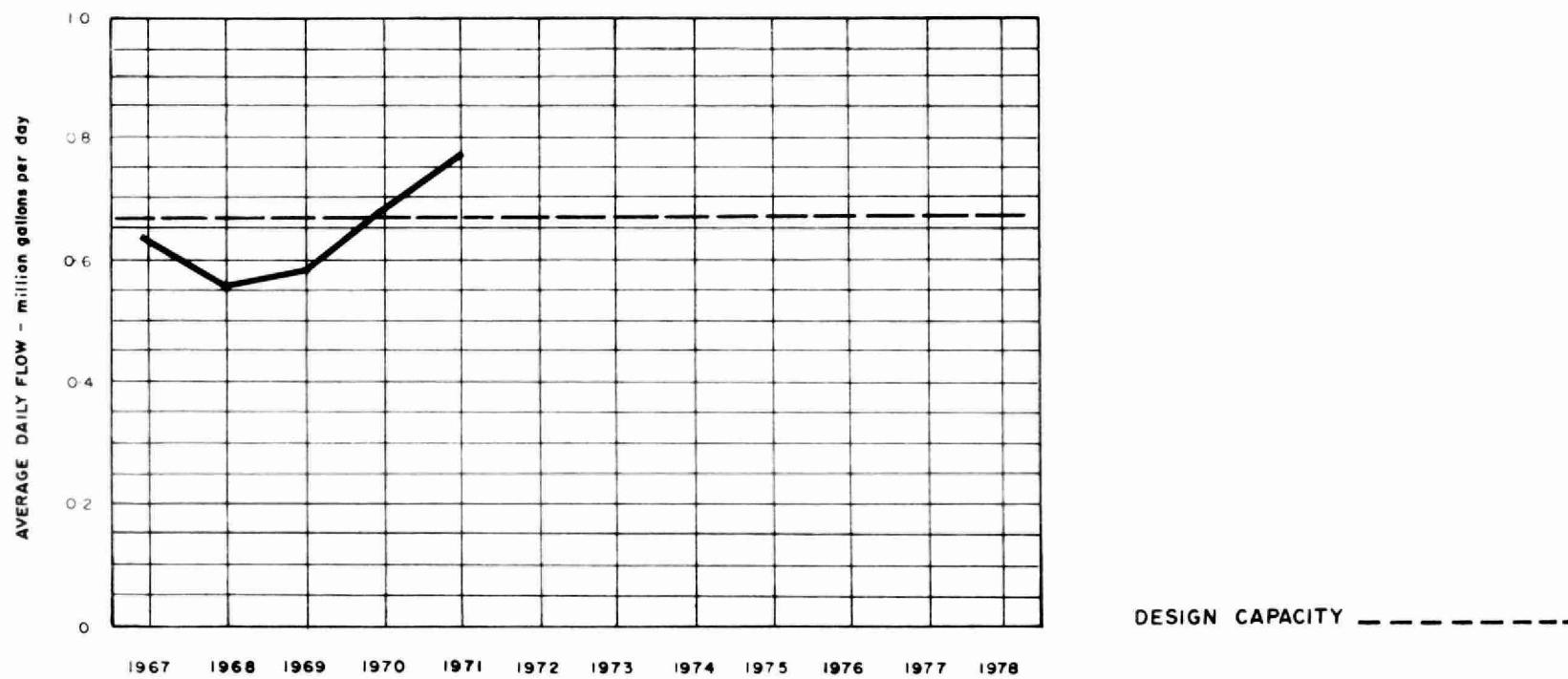
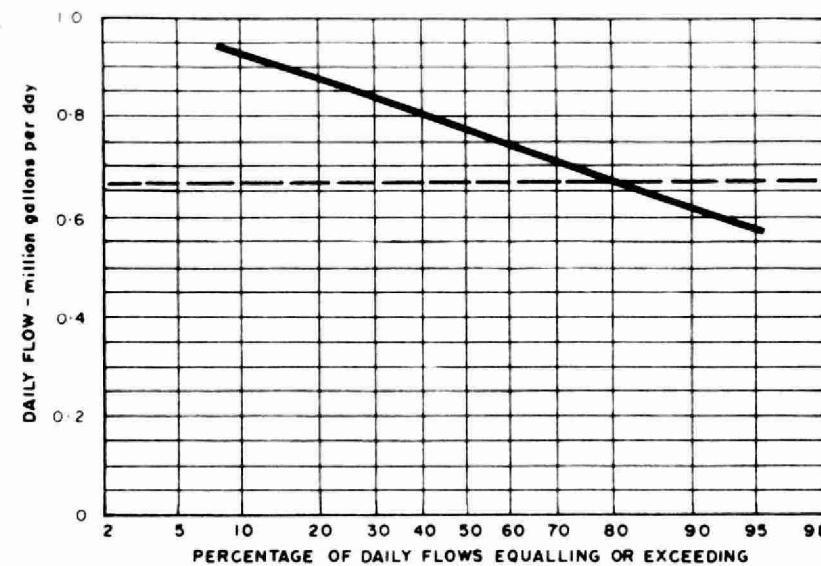
MONTH	TOTAL EXPENDITURE	REGULAR PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDY*	WATER	TRAVEL
JAN	1840.38	1338.01	-	-	422.75	-	13.00	-	66.62	-	-	-
FEB	4514.17	1913.17	-	132.19	493.10	-	85.03	-	70.62	1765.68	18.98	35.40
MAR	3267.49	1329.91	-	267.62	456.23	290.59	68.61	-	53.79	769.99	-	30.75
APR	2874.12	1415.24	-	-	474.04	-	67.22	-	98.60	766.45	19.42	33.15
MAY	2794.96	1298.02	120.52	106.11	529.31	-	79.58	-	53.48	572.24	-	35.70
JUNE	4013.99	1394.35	(120.52)	139.81	481.31	973.88	61.09	-	366.51	687.26	-	30.30
JULY	3442.81	1318.57	182.82	-	552.87	278.25	60.67	-	145.14	828.92	35.67	39.90
AUG	3183.86	1399.48	347.32	-	541.99	-	55.22	-	125.85	714.00	-	-
SEPT	4278.90	1347.86	420.20	-	472.27	356.58	85.33	-	209.33	1335.28	-	52.05
OCT	2714.88	1781.36	-	-	507.31	278.25	69.46	-	-	22.05	42.95	13.50
NOV	4134.90	2299.03	-	121.13	526.38	166.76	29.89	-	111.71	844.60	-	35.40
DEC	6520.76	2205.52	-	-	510.56	251.25	78.46	184.80	273.16	2878.94	29.23	108.84
TOTAL	43581.22	19040.52	950.34	766.86	5968.12	2595.56	753.56	184.80	1574.81	11185.41	146.25	414.99

Brackets indicate credit.

* Sundry includes sludge haulage costs of \$9,135.00

PROCESS DATA

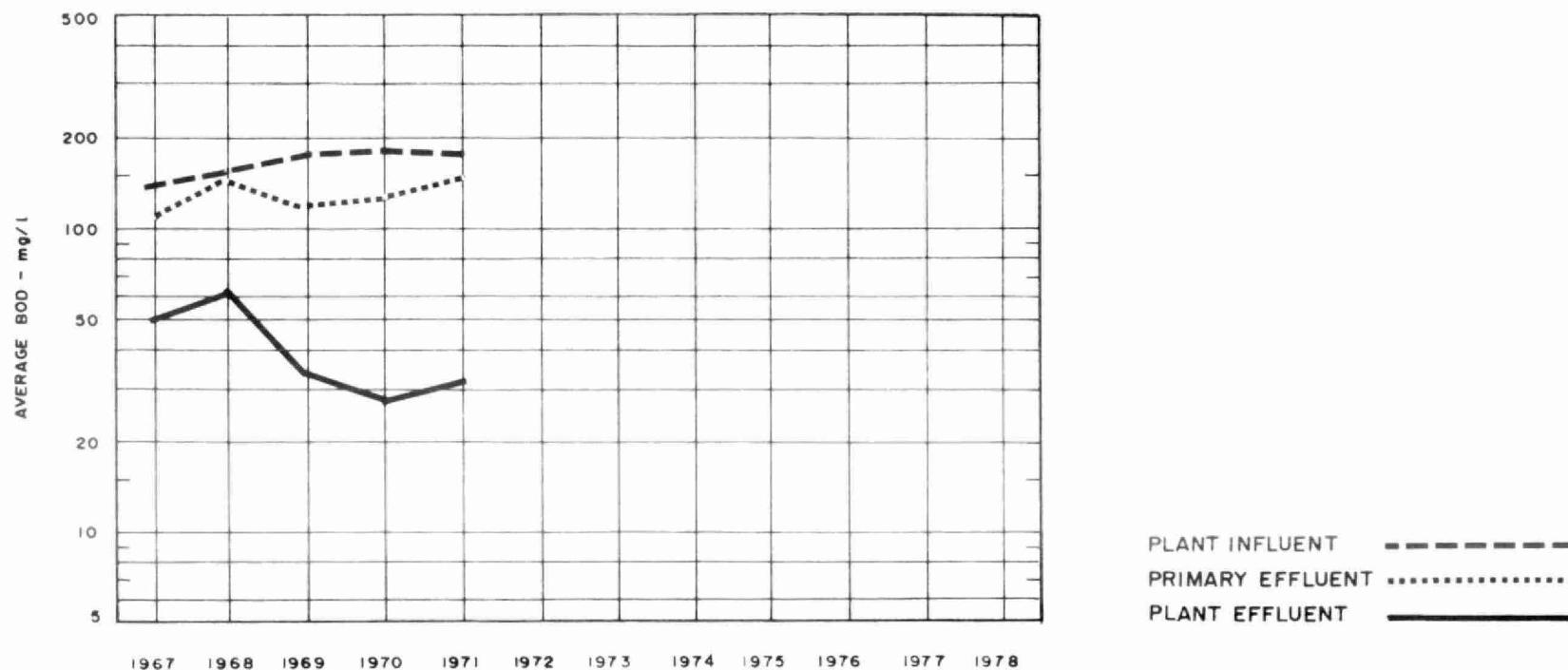
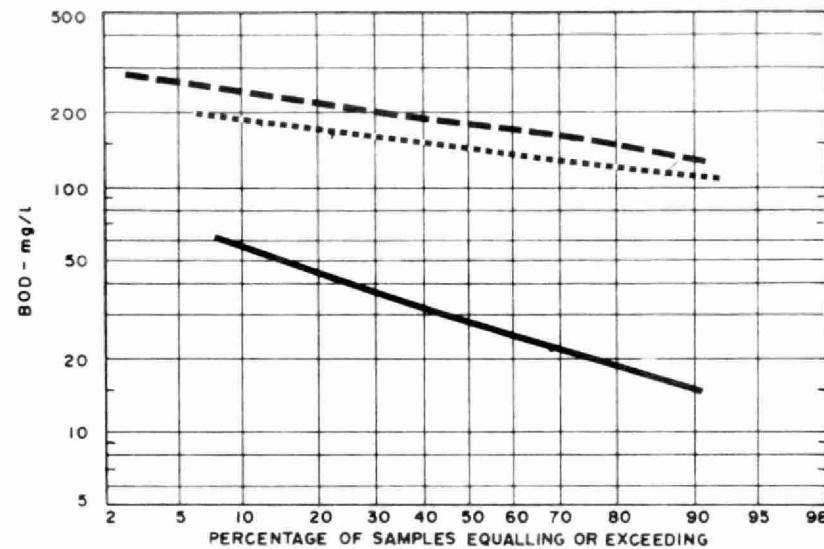
FLOWS



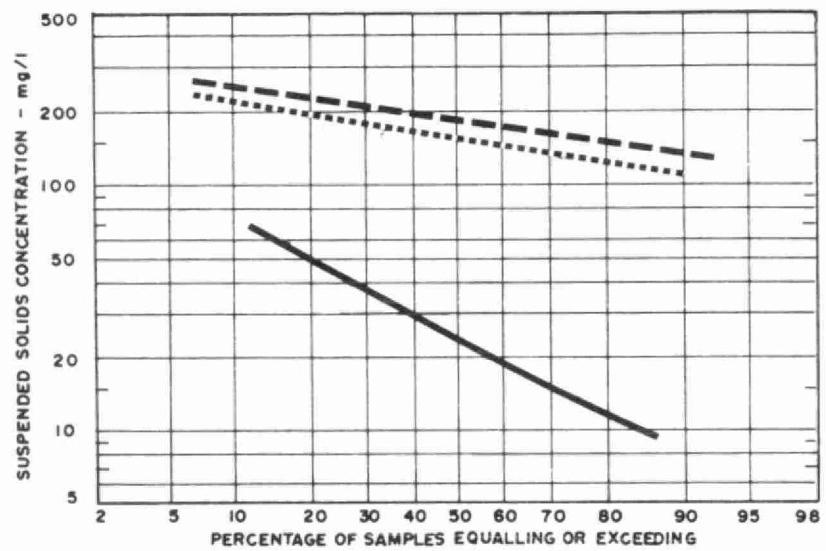
PLANT PERFORMANCE

MONTH	FLOWS				BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				TOTAL PHOSPHORUS		
	TOTAL FLOW million gallons	AVERAGE DAY mil gal	MAXIMUM DAY mil gal	MAXIMUM RATE mgd	INFLUENT mg/l	EFFLUENT mg/l	REDUCTION		INFLUENT mg/l	EFFLUENT mg/l	REDUCTION		INFLUENT mg/l as P	EFFLUENT mg/l as P	REDUCTION %
							%	10 ³ pounds			%	10 ³ pounds			
JAN	-	.70	.75	.98	175	32	82	-	175	40	77	-	13.	7.8	40
FEB	-	.96	1.19	2.00	190	29	95	-	220	28	87	-	12.	7.7	36
MAR	23.6	.76	.79	2.00	195	43	78	36.	360	50	86	73.	12.	5.3	56
APR	29.1	.97	1.16	2.00	165	46	72	35.	160	45	72	33.	9.	7.2	20
MAY	23.8	.76	.84	1.83	205	39	81	39.	165	18	89	35.	12.	7.2	40
JUNE	22.1	.74	1.00	1.70	200	25	88	39.	355	40	89	70.	11.	6.4	42
JULY	21.3	.68	1.18	2.00	160	40	75	26.	180	13	93	36.	9.	4.2	53
AUG	22.8	.73	1.01	2.00	165	15	91	34.	215	8	96	47.	10.	5.5	43
SEPT	21.7	.72	.91	1.80	125	15	88	24.	200	13	93	41.	13.	6.3	52
OCT	22.4	.72	.81	1.54	170	51	70	26.	160	38	76	27.	11.	6.9	37
NOV	22.0	.73	.80	1.96	190	37	81	34.	185	25	86	35.	7.	7.5	0
DEC	27.5	.89	1.27	1.84	145	23	84	34.	157	18	89	38.	11.	7.1	35
TOTAL	280. est	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG.	-	.77	1.27	2.00	174	33	81	33.	211	28	87	44.	11.	6.9	37
No. of Samples	-	-	-	-	24	24	-	-	24	24	-	-	23	23	-

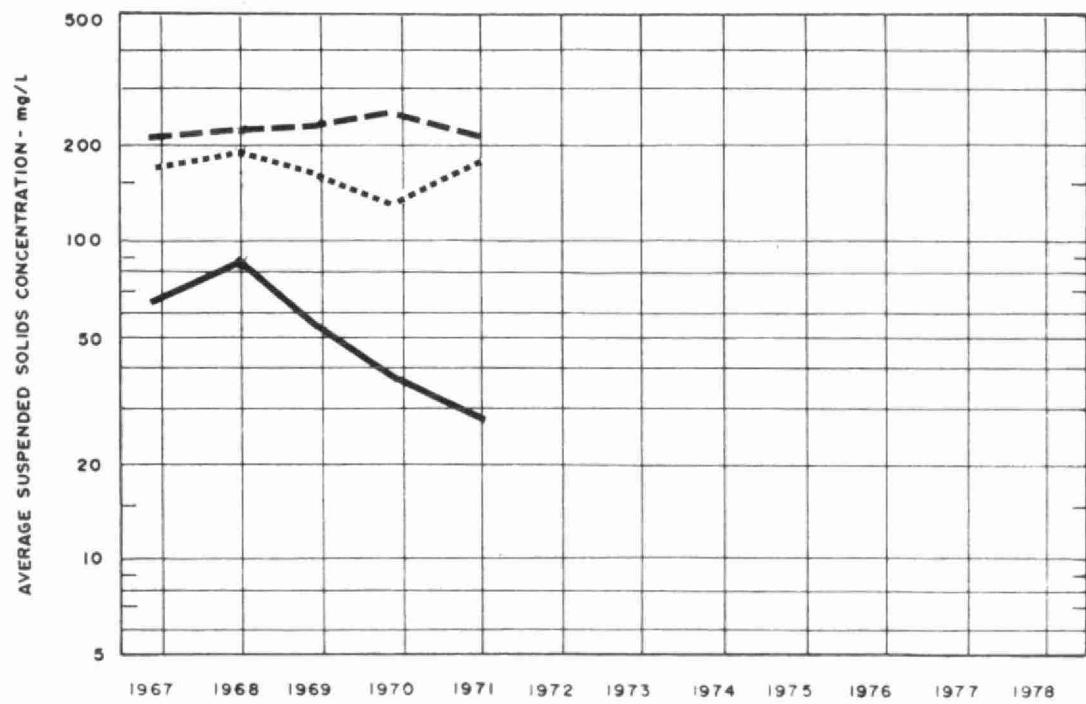
BIOCHEMICAL OXYGEN DEMAND



SUSPENDED SOLIDS



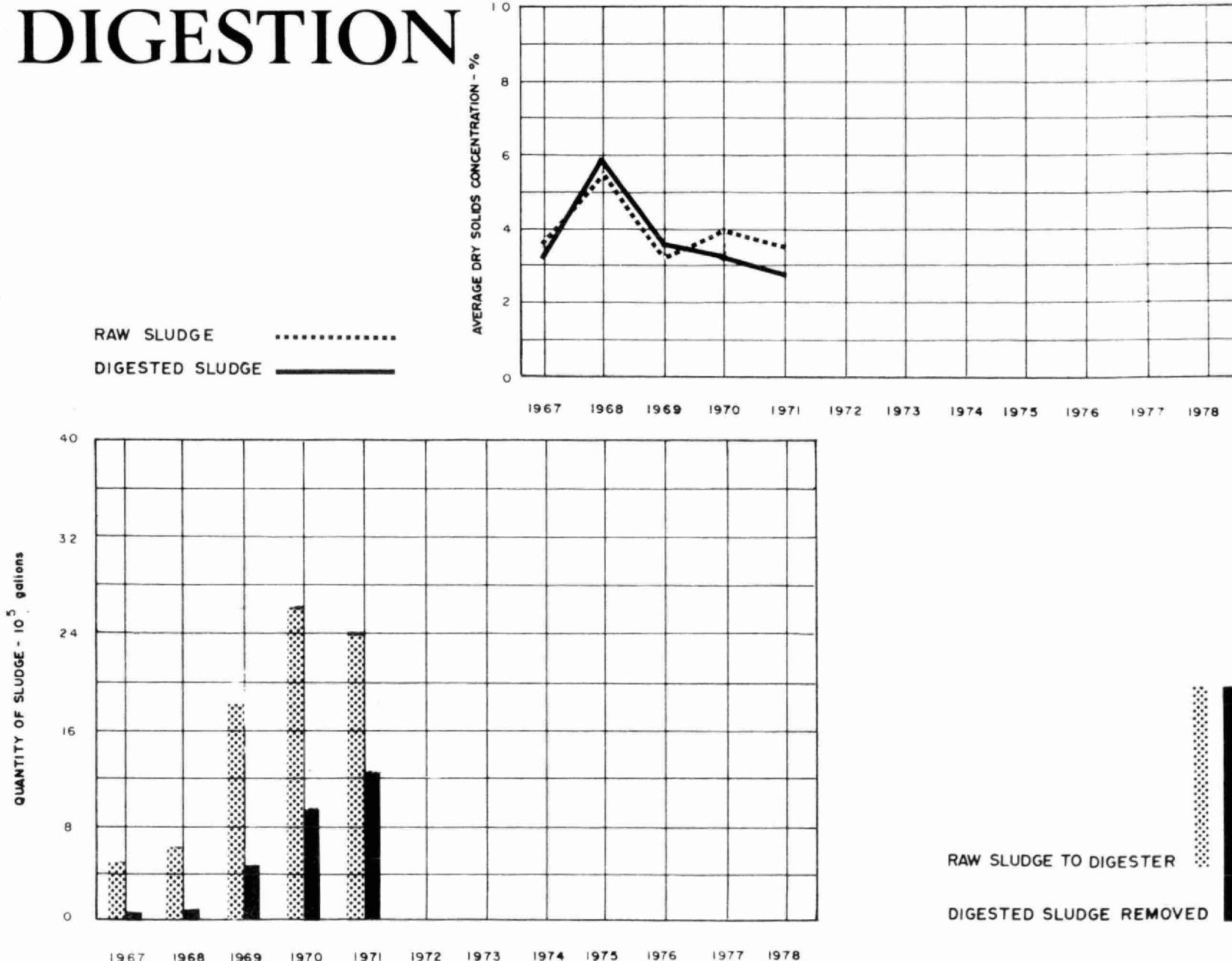
PLANT INFLUENT
PRIMARY EFFLUENT
PLANT EFFLUENT



TREATMENT DATA

MONTH	GRIT	CHLORINATION		PRIMARY EFFLUENT		AERATION			SLUDGE DIGESTION and DISPOSAL							
		QUANTITY REMOVED cubic feet	CL ₂ USED ^{10³} pounds	Avg. DOSE mg/l	BOD mg/l	SUSPENDED SOLIDS mg/l	MLSS CONC mg/l	F/M day ⁻¹	AIR 1000 ft ³ lb BOD	RAW SLUDGE			DIGESTED SLUDGE			SUPER- NATANT T.S. %
										QUANTITY ⁵ 10 gallons	TOTAL SOLIDS %	VOL. SOLIDS %	QUANTITY ⁵ 10 gallons	TOTAL SOLIDS %	VOL. SOLIDS %	
JAN	45	.71	3.3	150	140	2290	.3	1.9	2.25	4.6	63	1.10	2.8	53	-	653
FEB	135	.70	3.3	150	140	1980	.5	1.4	2.02	3.1	70	1.02	2.4	52	-	605
MAR	70	1.17	5.0	120	160	4520	.1	2.5	2.02	4.4	54	1.02	5.0	75	-	605
APR	80	1.16	4.0	155	135	2460	.4	1.4	1.83	-	-	.80	-	-	-	475
MAY	107	1.17	4.9	180	135	2870	.3	1.4	2.01	3.6	69	.92	-	-	-	545
JUNE	50	1.16	5.2	140	150	2660	.3	2.6	1.62	2.6	58	1.11	4.2	53	-	628
JULY	40	1.17	5.5	120	105	3390	.2	2.3	1.64	3.9	64	1.02	2.1	47	-	604
AUG	75	1.14	5.0	140	165	3080	.2	1.7	2.02	3.4	63	0.90	2.5	54	-	509
SEPT	85	1.20	5.5	105	125	2470	.2	2.8	2.10	4.3	56	1.24	2.7	47	-	733
OCT	100	1.21	5.3	145	175	2350	.3	1.8	2.16	3.3	67	1.00	2.7	55	-	594
NOV	65	1.05	4.8	185	545	2850	.3	1.5	2.30	2.8	67	1.20	2.2	55	-	713
DEC	85	1.17	4.3	180	210	2680	.4	1.2	2.43	3.2	64	1.39	2.4	66	-	865
TOTAL	937	13.01	-	-	-	-	-	-	24.40	-	-	12.72	-	-	-	6924
AVG.	3.3 <small>cu.ft./mil gal</small>	1.08	4.6	148	182	2800	.3	1.9	2.03	3.6	63	1.06	2.9	56	-	577

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